

The Trechid Beetles of the Island of Yaku-shima, Southwest Japan

By

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Yaku-shima is a mountainous island of about 500 km² in area and lies about 60 km south of the southern tip of Kyushu. It has been currently considered to belong to the Ohsumi group of the Ryukyus, but is topographically closer to Kyushu than to the other island groups of the archipelago. This relationship exerts a profound influence on the fauna and flora, which are primarily of northern origin, although many subtropical lowland forms are also found, especially among winged insects. The mountains, collectively called the Yaé-dakés, occupy the greater part of the island. They are largely granitic and very steep, rising 1,935 m above sea-level at the highest point, Miyanoura-daké, which is higher than any peak in the mainland of Kyushu. The upper parts of these mountains are very wet because of unusually high precipitation and are densely covered with temperate forests. Thus, the island has afforded an environment favourable for the colonization of trechine beetles.

Dealing with the trechid fauna of the Ryukyu Islands, I (1974, pp. 157, 164) made a preliminary reference to that of Yaku-shima and remarked that the island harboured two endemic saprophilous trechines, one of which was new to science. However, a closer investigation of the Yaé-daké Mountains made in the summer of 1974 revealed that there really occurred three different species of humicolous trechines in these mountains. One of them is *Epaphiopsis janoi* (JEANNEL), while the other two seem to belong to new species. In the present paper, I am going to describe or redescribe all these endemic species and also to record a winged widespread species for the first time from the island.

The abbreviations used in this article are as follows: HW—greatest width of head, including eyes; PW—greatest width of pronotum; PL—length of pronotum, measured along the mid-line; PA—width of pronotal apex; PB—width of pronotal base; EW—greatest width of elytra; EL—greatest length of elytra; M—arithmetic mean; NSMT—National Science Museum (Nat. Hist.), Tokyo; MP—Muséum National d'Histoire Naturelle, Paris; BM—British Museum (Nat. Hist.), London; TS—Mr. Taichi SHIBATA's collection.

Before going into details, I wish to acknowledge my indebtedness to Mr. Toku WATANABE and his family for their invaluable help in making difficult collectings in the high

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mountains of Yaku-shima, to Mr. Taichi SHIBATA for kindly supplying me with important material, and to Dr. A. DESCARPENTRIES and Mr. P. M. HAMMOND for giving me the privilege of studying the original specimens of *Epaphiopsis janoi*.

***Perileptus* (s. str.) *japonicus* H. W. BATES, 1873**

Perileptus Japonicus H. W. BATES, 1873, Trans. ent. Soc. London, 1873, p. 296; type-locality: Hiogo.
Perileptus (s. str.) *japonicus*: S. UÉNO, 1974, Mem. Natn. Sci. Mus., Tokyo, (7), p. 158.
 Other references are omitted.

Specimen examined. 1♀, Anbō, on the eastern coast of Is. Yaku-shima, 20-V-1960, Y. KONISHI leg. (NSMT).

Notes. This species does not seem so common in the Island of Yaku-shima, probably because of the scarcity of favourable habitats. The specimen cited above is perfectly identical with mainland individuals.

***Epaphiopsis* (*Pseudepaphius*) *janoi* (JEANNEL, 1937)**

(Figs. 1-3)

Trechus (*Epaphius*) *Janoi* JEANNEL, 1937, Bull. Soc. ent. France, 42, p. 82; type-locality: Ile Yaku-shima, Mananoego (misreading of Hananoégô).
Trechus (*Epaphius*) *janoi*: S. UÉNO, 1953, Shin Konchû, Tokyo, 6 (11), pp. 40, 42.
Epaphius (s. str.) *Janoi*: JEANNEL, 1962, Rev. fr. Ent., 29, pp. 176, 181, fig. 11.
Epaphiopsis (*Pseudepaphius*) *janoi*: S. UÉNO, 1962, Mem. Coll. Sci. Univ. Kyoto, (B), 29, p. 71.

Length: 2.80-3.55 mm (from apical margin of clypeus to apices of elytra).

Body short, broad and convex; apterous. Colour reddish brown, shiny, faintly iridescent on elytra; margins of elytra usually a little lighter than the disk; palpi, scape and apical half of antennae, ventral side, and legs more or less paler than the dorsal side of body.

Head small, transverse and more or less depressed above, with deep entire frontal furrows which are regularly curved and not angulate at middle; frons and supraorbital areas gently convex; supraorbital pores close to each other and situated on lines gently convergent anteriorly, the anterior one being usually foveolate; microsculpture distinct, largely consisting of transverse polygonal meshes; eyes variable in size, though only feebly convex in any case; genae variable both in length and in convexity, one-third to seven-tenths as long as eyes, gently convex in the majority of the specimens examined but almost flat in some individuals; neck wide, with distinct constriction anteriorly; labrum transverse, with the apex shallowly emarginate and slightly bisinuate; mentum tooth usually simple, sometimes subtruncated at the tip; submentum quadrisetose, lacking in the outermost pair of setae; palpi short and fairly thick, with subconical apical segments; antennae short and subfiliform, reaching basal one-fourth of elytra, with segment 2 about as long as segment 4 and slightly shorter than segment 3; antennal segments 7-10 subcylindrical, each more than twice as long as wide, terminal segment the longest though narrower than scape.

Pronotum large, transverse and convex, widest at about three-fifths from base and more

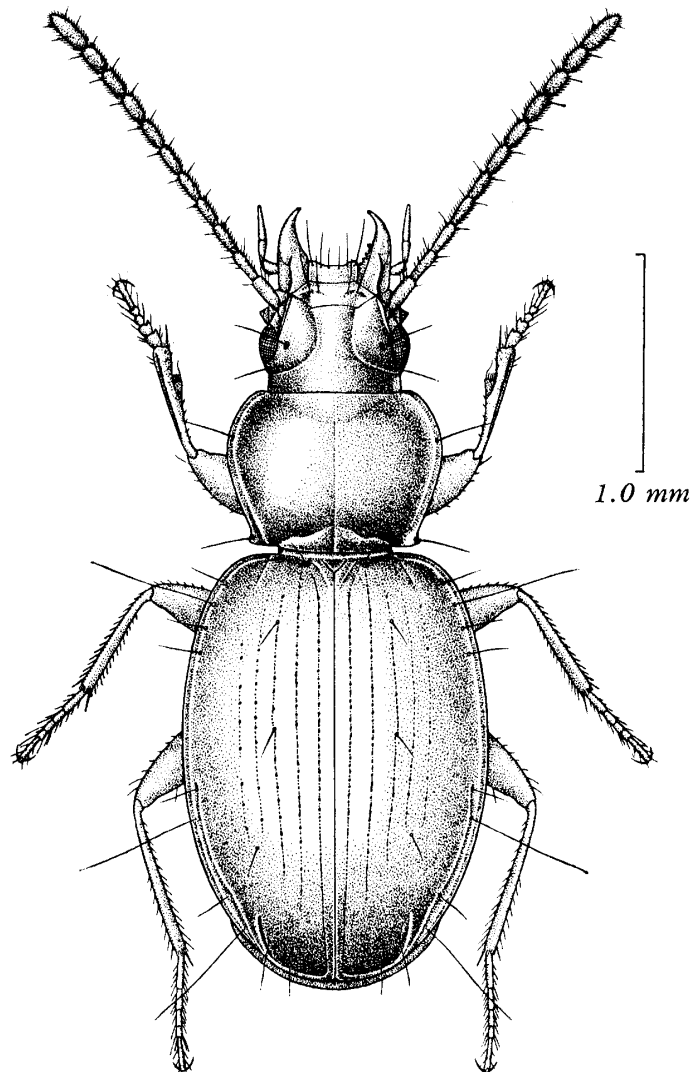


Fig. 1. *Epaphiopsis (Pseudepaphius) janoi* (JEANNEL), ♂, of Hananoégô in Is. Yaku-shima.

rapidly contracted anteriorly than posteriorly; PW/HW 1.38–1.51 (M 1.44), PW/PL 1.24–1.35 (M 1.31), PW/PA 1.41–1.53 (M 1.47), PW/PB 1.23–1.34 (M 1.29); surface smooth, micro-sculpture largely consisting of fine transverse lines though partially obliterated; sides rather widely reflexed behind middle, but the borders become much narrower near front angles, moderately arcuate in front, less so behind middle, and not sinuate before hind angles, which are distinct, either rectangular or obtuse, and almost always denticulate; apex either straight or slightly arcuate, with front angles hardly advanced; base wider than apex, PB/PA 1.09–1.19 (M 1.14), slightly arcuate and produced at middle, and shallowly emarginate on each side, the portion just inside each hind angle being either perpendicular to the mid-line or slightly oblique; median line distinct, more or less deepening near base; apical transverse impression shallow, either smooth or vaguely wrinkled; basal transverse impression deep, almost continuous and nearly smooth; basal foveae fairly large though shallow and mal-defined, smooth at the bottom; postangular carinae usually present

though obtuse; basal area longitudinally strigose along the basal border.

Elytra ample, ovate and convex, widest at about middle; EW/PW 1.35–1.51 (M 1.42), EL/EW 1.30–1.40 (M 1.36); shoulders distinct though rounded, with prehumeral borders usually perpendicular to the mid-line at the innermost portion; sides narrowly bordered and gently arcuate, without distinct preapical emargination; apices conjointly rounded; striae deeply impressed and coarsely punctate on the disk but more or less obsolete at the side, stria 1 always entire, 2–3 usually disappearing both near base and before apex though sometimes entire, 4–5 more or less shallower and finer than the inner ones, 4 usually obliterated at the two ends but 5 more or less deepening near base, 6–7 usually traceable at middle though very slight, sometimes obsolete altogether, 8 deeply impressed behind the level of the fifth pore of the marginal umbilicate series; scutellar striae distinct; apical striae short but deeply impressed, not joining any stria at the anterior end though directed to stria 5; intervals flat even near suture; apical carina distinct though short; stria 3 with two setiferous dorsal pores at about 1/5 and 4/9 from base respectively; interval 5 with a single setiferous dorsal pore at 2/3–3/4 from base, usually at the anastomosis of striae 4 and 5 but sometimes adjoining stria 5; preapical pore absent; apical pores normal; marginal umbilicate pores regular; microsculpture composed of fine transverse lines.

Ventral surface smooth; sexual setae on anal sternite normal. Legs short and stout; protibiae moderately dilated towards apices and hardly bowed, each with a distinct groove on the external face and with several minute hairs on the anterior face between comb organ and apex; tarsi fairly thin, segment 4 with a hyaline ventral apophysis in pro- and mesotarsi; in ♂, protarsal segments 1 and 2 widely dilated and inwardly denticulate at apices.

Male genital organ fairly large and moderately sclerotized. Aedeagus rather slender, about one-third as long as elytra, moderately arcuate from base to apex, and widely membranous on the dorsal side; basal part considerably variable in shape owing to the difference in the depth of the lateral emargination of basal orifice, though always relatively small and elongate; basal orifice not large, but deeply emarginate at the sides (often much more deeply emarginate than in the specimen illustrated in Fig. 2); sagittal aileron large, elongate and well sclerotized; viewed laterally, apical lobe thin, gradually tapering towards blunt apex, which is slightly turned up; viewed dorsally, apical lobe broadly subtriangular, somewhat inclined to the left and ending in a blunt extremity; ventral side widely emarginate in profile. Inner sac uniformly covered with small, poorly chitinized scales but without sclerotized teeth. Styles slender, left style larger and longer than the right, each normally provided with four setae at apex, though a fifth seta sometimes exists on one style.

Type depository. Muséum National d'Histoire Naturelle, Paris.

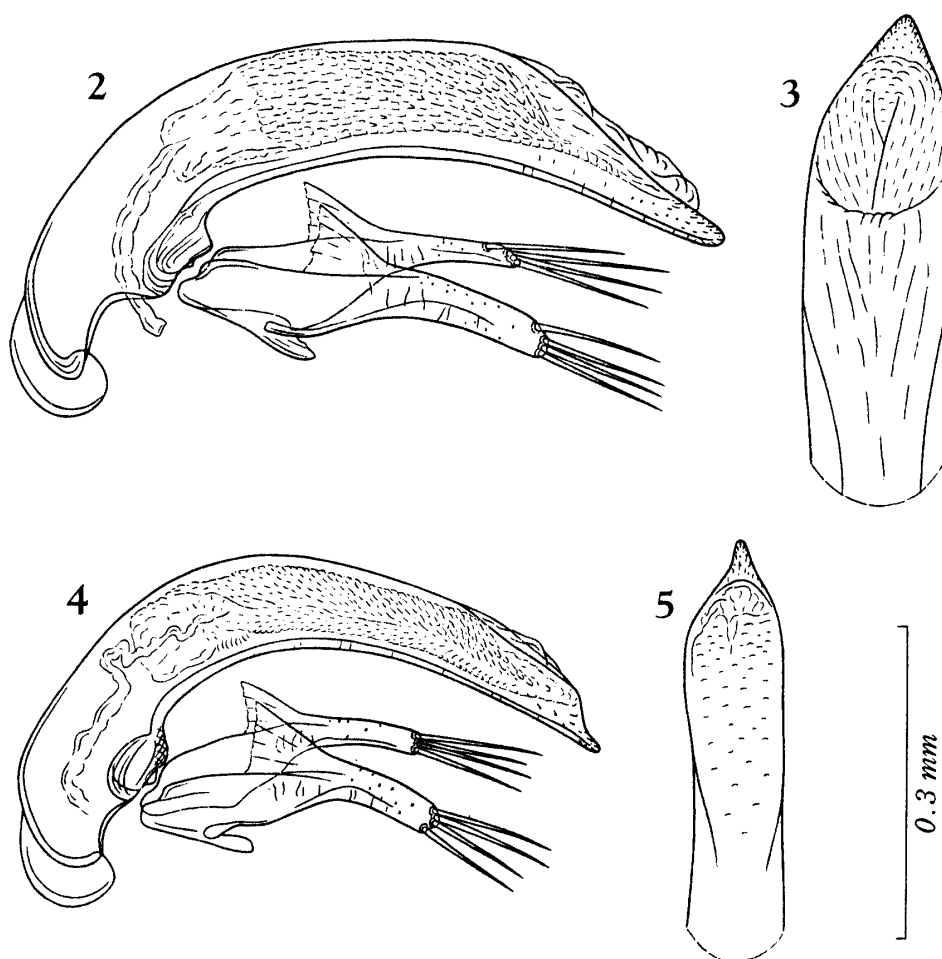
Both the holotype (♂) and the paratype (♀) are preserved in the Paris Museum. A female specimen found in the British Museum collection is not a true paratype, since JEANNEL examined only 'deux exemplaires' when he described this species, although the BM specimen doubtless belongs to the original series. Another specimen (♀) from the original series is preserved in the collection of the National Science Museum, Tokyo.

Specimens examined. 1♂, 3♀♀, Hananoégô, 1,600 m alt., 17–VII–1936, Y. YANO leg.

(MP, BM & NSMT); 3♂♂, 3♀♀, Hananoégô, 14-VIII-1965, N. KONISHI leg. (NSMT & TS); 3♂♂, 1♀, Hananoégô, 1,640 m alt., 26-VII-1974, S. UÉNO leg. (NSMT); 8♂♂, 5♀♀, Ishizuka-rindô, 1,350-1,500 m alt., 27-VII-1974, S. UÉNO leg. (NSMT); 1♂, 2♀♀, Kosugidani, 1,300-1,380 m alt., 13-VII-1960, K. MORIKAWA leg. (NSMT); 1♀, Miyanoura-daké, 1,200 m alt., 24-X-1955, R. YOSHI leg. (NSMT); 2♂♂, 3♀♀, Yodogawa, 1,360 m alt., 25-VII-1974, S. UÉNO leg. (NSMT); 2♂♂, 1♀, Yakusugi-land, 1,200 m alt., 3-VII-1975, Y. KUROSAWA leg. (NSMT); 2♂♂, 2♀♀, Nagata-daké, 1,660 m alt., 29-VII-1974, S. UÉNO leg. (NSMT); 2♂♂, 6♀♀, Shikanosawa, 1,530 m alt., 29~30-VII-1974, S. UÉNO leg. (NSMT); 9♂♂, 16♀♀, Hanayama, 1,250-1,500 m alt., 31-VII-1974, S. UÉNO leg. (NSMT).

Localities. Kosugi-dani, Ishizuka-rindô, Yakusugi-land, Yodogawa (or Yodogô), Hananoégô (type-locality!), Miyanoura-daké, Nagata-daké, Shikanosawa and Hanayama, all in the Yaé-daké Mountains of the Island of Yaku-shima, off southern Kyushu, Southwest Japan.

Of the nine localities listed above, the first four are situated on the eastern slope of the main peaks and the last three are on the western side of them. The type-locality, Hana-



Figs. 2-5. Male genitalia of *Epaphiopsis* (*Pseudepaphius*) spp.; left lateral view (2 and 4), and apical part of aedeagus, dorsal view (3 and 5).—2-3. *E. (P.) janoi* (JEANNEL), of Hananoégô.—4-5. *E. (P.) watanabeorum* S. UÉNO, sp. nov., of Shikanosawa.

noégô, is a marshy place at the southern part of the main watershed, but according to my own experience, the trechine is rather rare in the immediate vicinities of Hananoégô. Perhaps the type material was taken at a higher part of Ishizuka-rindô en route from Kosugidani to Hananoégô.

Notes. This is the flightless trechine beetle most widely distributed in the Island of Yaku-shima, and probably occurs everywhere in the temperate forests above 1,000 m in altitude. It usually dwells in leaf mold, above all in places where tree rootlets are entangled below the litter, though it is also found under stones or rotten logs in shaded places. It is considerably variable in size, and the largest individuals appear specifically different from the smallest ones. However, various intermediate individuals occur within single populations, and the two extremes are identical with each other in the characteristic features of male genitalia.

This and the following species, both endemic to the Island of Yaku-shima, form a particular species-group in the subgenus *Pseudepaphius*, being characterized by the absence of the preapical pore on elytra. Such a differentiation is noticeable, since other members of the subgenus are rather uniform throughout the southwestern parts of the Japanese mainland.

Epaphiopsis (*Pseudepaphius*) watanabeorum S. UÉNO, sp. nov.

(Figs. 4–6)

Length: 2.60–3.20 mm (from apical margin of clypeus to apices of elytra).

Closely allied to the preceding species, but smaller on an average and distinguished from the latter by the darker coloration, less convex dorsum, very obtuse hind angles of pronotum, less ovate elytra with shallower and only finely punctate striae, and so on. The two species are readily discriminated from each other also by the shape of their aedeagi.

Evidently more depressed than in *E. janoi*. Colour dark brown or dark reddish brown, shiny, iridescent on elytra; disk of elytra often blackish; margins of each elytron usually reddish in dark individuals; palpi, scape and apical segments of antennae, ventral side, and legs yellowish brown to brown, more or less lighter than the dorsal side of body.

Head as in the preceding species though somewhat larger on an average; eyes similarly variable in size, genae one-third to two-thirds as long as eyes; antennae reaching basal two-sevenths of elytra or extending slightly beyond that level in ♂, but reaching basal one-fourth of elytra in ♀. Pronotum less convex on the disk than that in *E. janoi* and evidently different in the shape of hind angles, though otherwise very similar to the latter, the widest part being usually at about three-fifths from base; PW/HW 1.35–1.47 (M 1.40), PW/PL 1.25–1.38 (M 1.32), PW/PA 1.43–1.53 (M 1.47), PW/PB 1.27–1.40 (M 1.33), PB/PA 1.06–1.20 (M 1.11); base slightly arcuate at the median part, more strongly and obliquely arcuate inside each hind angle, forming a very obtuse re-entrant angle on each side between median and lateral parts; hind angles very obtuse, not denticulate and often effaced, with the posterior margin always roundly oblique; front angles more widely rounded than in *E. janoi*; surface usually with vague transverse striations. Elytra less ovate and much less convex than in *E. janoi*, a little more elongate on an average, with ampler apical

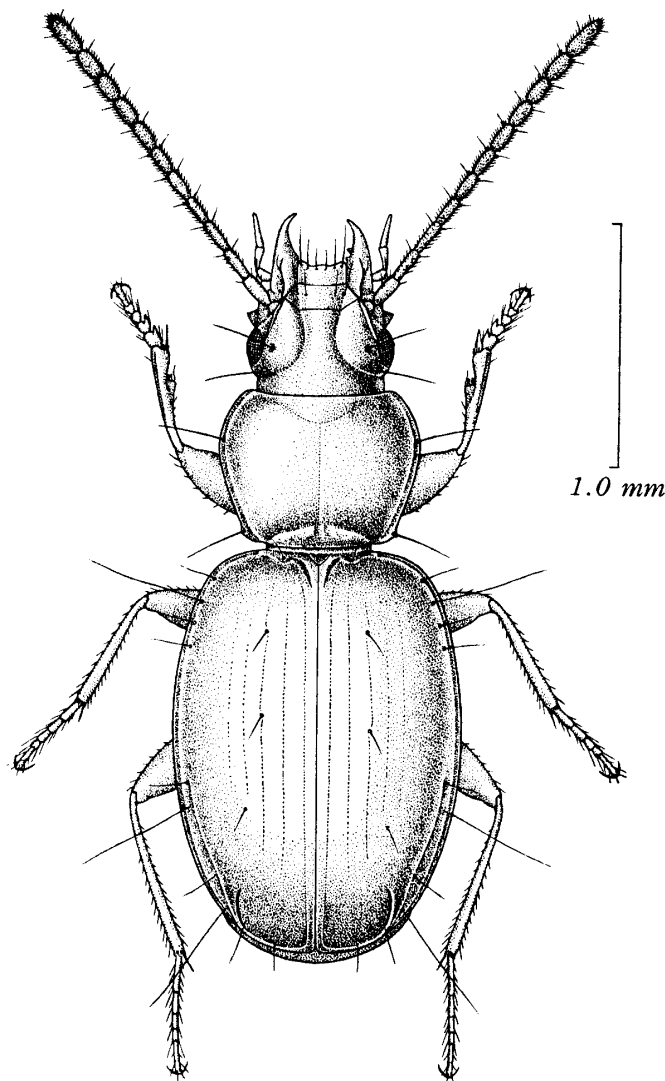


Fig. 6. *Epaphiopsis* (*Pseudepaphius*) *watanabeorum* S. UENO, sp. nov., ♂, of Shikanosawa in Is. Yaku-shima.

part; EW/PW 1.35–1.45 (M 1.41), EL/EW 1.33–1.44 (M 1.39); sides less evenly arcuate and a little more widely reflexed, more widely rounded at apices though having a small re-entrant angle at suture; striae superficial, usually shallower on the disk than in *E. janoi*, and only finely punctate even near suture, stria 1 always entire, others obsolete near base and also before apex and becoming fainter towards the side, stria 5 usually traceable at middle though sometimes obsolete, 6–7 usually obliterated though sometimes perceptible as a trace, 8 deeply impressed behind the level of the fifth pore of the marginal umbilicate series; apical striae usually a little longer and more widely curved than in *E. janoi*, with longer apical carina; setiferous dorsal pores on stria 3 at about $1/5$ and $3/8-1/2$ (usually about $2/5$) from base respectively, that on interval 5 at about $2/3$ from base; microsculpture irregular as compared with that in *E. janoi*; other features as in *E. janoi*.

Legs as in *E. janoi*, but somewhat slenderer and with shallower groove on the external

face of each protibia, which is usually glabrous at the antero-apical part.

Male genitalia markedly different in shape from those of *E. janoi*. Aedeagus about three-eighths as long as elytra, slender and semicircularly arcuate, with the basal part not bent towards the ventral side; basal orifice small, with the lateral sides shallowly emarginate; sagittal aileron well developed; apical part fairly broad to near apex, then abruptly narrowed and produced into a short narrow lobe; viewed laterally, ventral side deeply emarginate at middle but nearly straight before apex. Inner sac as in *E. janoi*. Styles relatively short, each provided with four apical setae.

Type-series. Holotype: ♂, allotype: ♀, Shikanosawa, 1,530 m alt., 29-VII-1974, S. UÉNO leg. (NSMT). Paratypes: 35♂♂, 22♀♀, Shikanosawa, 1,530 m alt., 29~30-VII-1974, S. UÉNO leg. (NSMT); 1♂, Shikanosawa, 1,550 m alt., 29-VII-1974, S. UÉNO leg. (NSMT); 1♀, Nagata-daké, 1,660 m alt., 29-VII-1974, S. UÉNO leg. (NSMT); 1♀, Koshikanosawa, 1,610 m alt., 31-VII-1974, S. UÉNO leg. (NSMT); 1♀, Hanayama, 1,300-1,500 m alt., 31-VII-1974, S. UÉNO leg. (NSMT).

Localities. Shikanosawa (type-locality!), Nagata-daké, Koshikanosawa and Hanayama, all at the western part of the Yaé-daké Mountains of the Island of Yaku-shima, off southern Kyushu, Southwest Japan.

Notes. This new trechine seems to be localized in the upper part of the Oh-kawa drainage at the western side of the Island of Yaku-shima. The four known stations, all above 1,500 m in altitude, lie in the immediate vicinities of the Shikanosawa Valley that goes down into the Oh-kawa. It occurs in coexistence with *E. janoi*, but appears to have a stronger preference for damp places. With the exception of a single individual, which was taken from under a stone at the side of a stream, all the known specimens were found under wet dead leaves in mixed temperate forests.

I have the pleasure of dedicating this unexpected new species to Mr. and Mrs. Toku WATANABE and their daughter, whose invaluable aid enabled me to make a thorough collecting in the Shikanosawa area of Yaku-shima.

Genus **Lamprotrechus** S. UÉNO, nov.

Type-species: *Lamprotrechus convexiusculus* S. UÉNO, sp. nov.

Body short, broad and convex, glabrous and polished on the dorsal surface but more or less pubescent on the ventral side; microsculpture entirely absent; colour dark brown to black; inner wings absent.

Head large, with deep entire frontal furrows and rather flat eyes; two pair of supra-orbital pores present on lines slightly convergent anteriad, the anterior one being foveiform and fairly close to the posterior; genae convex and glabrous. Labrum very deeply emarginate at apex, almost bilobed, and sexsetose. Mandibles short and stout, though sharply hooked at apices; bidentate; proximal tooth obtusely bicuspid and widely distant from the apical one on right mandible. Mentum free, not fused with submentum, with a broad tooth in apical emargination, which is either simple or slightly emarginate at the tip; submentum quadrisetose, lacking in the outermost pair of setae; ligula produced at middle; paraglossae

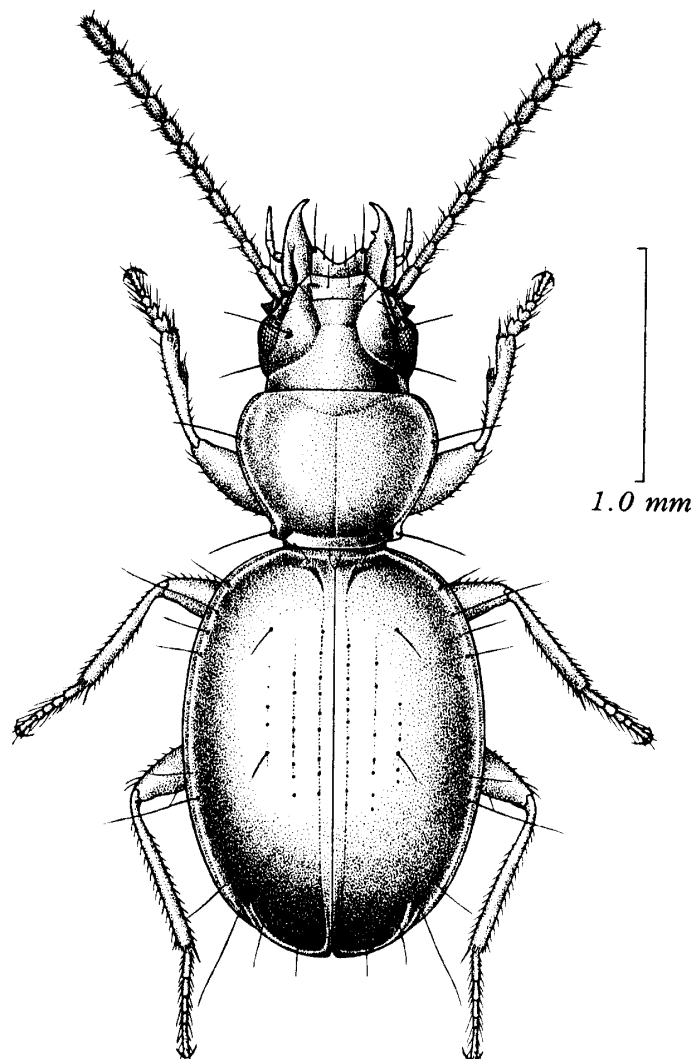


Fig. 7. *Lamprotrechus convexiusculus* S. UÉNO, gen. et sp. nov., ♂, of Shikanosawa in Is. Yaku-shima.

long and thin, extending much beyond ligula. Palpi short and stout; penultimate segments widely dilated towards apices, quadrisetose in labial palpus and with a few minute hairs around apex in maxillary palpus; apical segments subconical. Antennae submoniliform, short and stout.

Pronotum transverse cordate and convex, with the sides sharply bordered throughout and briefly sinuate just before hind angles, which are denticulate; marginal setae normal, the posterior one being situated almost on the hind angle; base arcuate; basal transverse impression continuous and sulciform, being parallel to base; basal foveae very small but deep.

Elytra short oval and convex; shoulders rounded, prehumeral borders arcuate and continuous to basal peduncle; sides moderately reflexed for the large part but becoming narrower to a fine innermost point at base; striae perfectly effaced near base, before apex

and at side, with the exception of the sutural one which is nearly entire; scutellar striole absent; apical striole short but deeply impressed, gently curved and directed to the site of stria 5; apical carina distinct; two setiferous dorsal pores present on the site of stria 3 but none on the site of stria 5; preapical pore absent; apical pores normal, the anterior one adjoining the terminal portion of apical striole; marginal umbilicate pores regular and aggregated, the humeral set being nearly equidistant; two umbilicate pores of the apical set close to each other and widely separated from the middle set, the distance between the sixth and seventh pores being about three times larger than that between the seventh and eighth.

Pro- and metasterna as well as sternites 2-3 sparsely pubescent at the median parts; sternites 3-5 each with an irregular transverse row of hairs along the posterior margin; anal sternite provided with a pair of sexual setae in ♂, with two pair of the setae in ♀. Legs short and stout; protibiae moderately dilated towards apices, entirely pubescent and not externally grooved; tarsi fairly thick, segment 4 with a hyaline ventral apophysis in pro- and mesotarsi; in ♂, two proximal segments of each protarsus moderately dilated, inwardly denticulate at apices, and furnished beneath with sexual adhesive appendages.

Aedeagus gutter-like, flattened and widely open on the dorsal side, though the basal part is completely closed and bears a fairly large sagittal aileron; apical lobe long, narrow and curved ventrad; inner sac armed with a large copulatory piece but devoid of sclerotized teeth; copulatory piece large, asymmetric and largely exposed, with an elongate apical lamella at the right side. Styles slender, with very narrow apical parts, each normally provided with only two apical setae.

Range. Known so far only from the Island of Yaku-shima, off southern Kyushu, Southwest Japan.

Notes. Although considerably differing in details, this new genus seems to have some relationship with the genus *Iga* S. UENO (1953 a, p. 30) of the Island of Shikoku. Both have the same conformation of head, buccal appendages¹⁾ and pronotal base; the pre-humeral borders of elytra show a similar disposition at the innermost part; the micro-sculpture and the elytral striae are similarly degenerated; the preapical pore of elytra is equally absent, though the apical pores are present as usual; and, the aedeagus is widely open on the dorsal side and bears a large copulatory piece of similar conformation in the two genera. The male genitalia of *Iga formicina* are of very peculiar shape mainly because of the excessively prolonged apical part, but in an undescribed species of the same genus, known at present only by an imperfect male specimen, the aedeagus is very similar in general appearance to that of *Lamprotrechus convexiusculus*.

On the other hand, *Lamprotrechus* is distinguished from *Iga* by the less strongly convex dorsum, the bilobed labrum, the absence of setae on pronotal disk, the entirely bordered sides of pronotum, the absence of the third dorsal seta on the site of elytral stria 3, the total

1) The original description of the labial structure of *Iga formicina* is not correct in several points, and needs a thorough revision. In reality, it closely resembles that of *Lamprotrechus* described in this paper, excepting the presence of the outermost pair of setae on submentum.

absence of dorsal seta on the site of elytral stria 5, the regularly aggregated marginal umbilicate pores, and the absence of external groove on each protibia. The loss of the external series of elytral dorsal pores is particularly important, and seems to span the gap between *Iga* and other Asian genera of problematical affinities.

JEANNEL (1962, p. 184) considered that *Iga* could be related to *Epaphiopsis* and might not have any affinity with *Stevensius* and its relatives. I have seen specimens, mostly the types, of all the described forms of *Stevensius*, *Agonotrechus* and *Kozlovites*, with the exception of *Agonotrechus tonkinensis* JEDLIČKA (1939, p. 1), and am convinced at present that both *Iga* and *Lamprotrechus* belong to the same phyletic line as *Stevensius* and *Agonotrechus*. It is true that these genera are not closely related to one another and that *Agonotrechus* is much less specialized than the other three, but they appear to form a natural group, which does not have direct relationship with any other described genera of trechine beetles. Perhaps, ancestral trechines similar to existing *Agonotrechus* may have been once widespread in southern and eastern Asia and have separately given rise to more specialized, localized forms at peripheral parts of their distribution. Thus, *Lamprotrechus* and *Iga* can be regarded as relicts of an old fauna, which existed in eastern Asia probably in the Tertiary.

***Lamprotrechus convexiusculus* S. UÉNO, sp. nov.**

(Figs. 7-9)

Length: 2.80-3.25 mm (from apical margin of clypeus to apices of elytra).

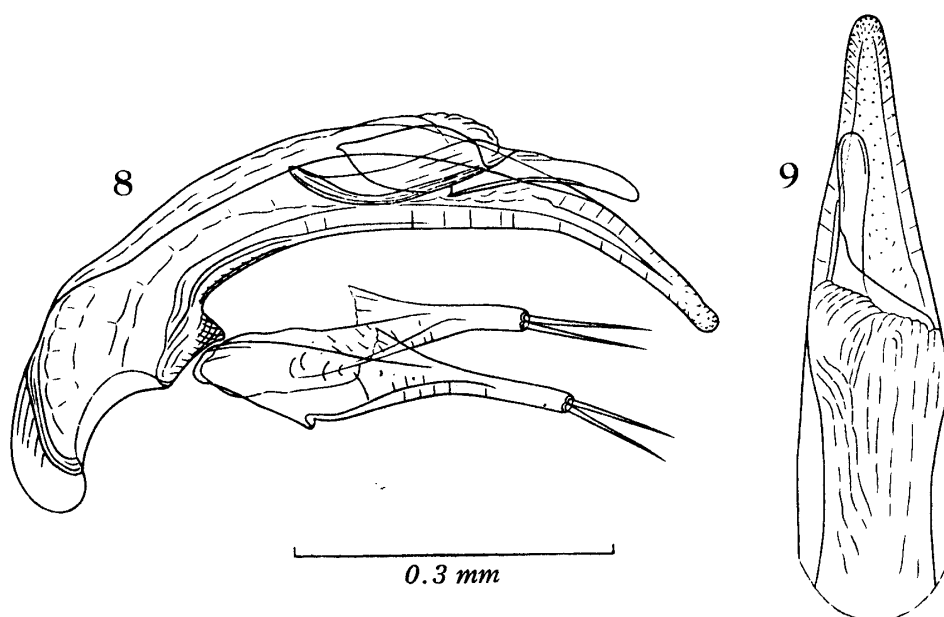
Body short, broad, and constricted between prothorax and hind body. Colour dark brown, polished, posterior two-thirds of head and disk of pronotum often black, apical half of elytra and apical sternites usually blackish; palpi, basal two or three segments of antennae (scape at least), epipleura and legs light brown to yellowish brown.

Head large and transverse, moderately depressed above, with gently convex frons and supraorbital areas, the former being transversely depressed at about middle; frontal furrows deep throughout and sharply cut, obtusely subangulate at middle, and widely divergent both in front and behind; eyes rather variable in size and in convexity, though more or less flat in any case, usually smaller in ♀ than in ♂; genae always much shorter than eyes, more or less convex and sometimes tumid, three-eighths to five-ninths as long as eyes; neck very wide, with sharply marked neck constriction at the sides; labrum about twice as wide as long, triangularly incised in front and forming a bilobed appearance; antennae short and stout, submoniliform, reaching basal one-fifth of elytra or extending beyond that level in ♂, usually a little shorter than that in ♀; antennal segment 2 as long as segment 4 and very slightly shorter than segment 3, segments 6-10 ovate, each more than a half as wide as long, terminal segment either as long as or slightly longer than scape but evidently narrower than the latter.

Pronotum transverse cordate, widest at about two-thirds from base and obviously more contracted towards base than towards apex; PW/HW 1.26-1.35 (M 1.31), PW/PL 1.24-1.35 (M 1.28), PW/PA 1.30-1.40 (M 1.36), PW/PB 1.52-1.64 (M 1.58); surface well convex and

smooth; sides strongly arcuate in front, less so behind middle, and briefly but distinctly sinuate just before hind angles, which are small, denticulate and nearly rectangular; apex evidently wider than base, either slightly arcuate or nearly straight at middle, PA/PB 1.11–1.21 (M 1.16); front angles rounded and not advanced; base arcuate and somewhat lobed, distinctly emarginate on each side just inside hind angle; median line distinctly impressed on the disk but becoming finer at the two ends and reaching neither apex nor base; apical transverse impression distinct and continuous though shallow, smooth throughout; basal transverse impression deep throughout, close to and parallel to the basal margin, forming a smooth carinate basal area; basal foveae very small but deep, smooth at the bottom; no postangular carinae.

Elytra short oval and convex, though more or less depressed near suture at the median part, being widest at about middle; EW/PW 1.44–1.57 (M 1.50), EL/EW 1.29–1.39 (M 1.34); shoulders widely rounded; sides gently arcuate at middle and very slightly emarginate before apices, which are almost conjointly rounded though bearing a very small re-entrant angle at suture; stria 1 deeply impressed on the disk and coarsely punctate, becoming fainter towards the two ends but distinctly impressed again at the basal portion, forming a false scutellar striole; stria 2 distinct on the disk and coarsely punctate, though more or less shallower than stria 1 and disappearing before the level of proximal dorsal pore; stria 3 either present on the disk or obsolete, faint even if traceable, and sometimes indicated only by punctures; striae 4–5 sometimes traceable at middle but usually evanescent, 6–7 always absent, 8 usually obsolete, sometimes present around the middle and apical groups of marginal umbilicate pores, and rarely perceptible at the apical part; apical striole deep, free at the anterior end; apical carina prominent though short; intervals flat even near



Figs. 8–9. *Lamprotrechus convexiusculus* S. UÉNO, gen. et sp. nov., of Shikanosawa in Is. Yaku-shima. — 8. Male genitalia, left lateral view. — 9. Apical part of aedeagus, dorsal view.

suture; setiferous dorsal pores situated at $1/6$ – $1/5$ from base and around middle.

Male genital organ lightly sclerotized. Aedeagus about three-eighths as long as elytra, elongate, flattened and arcuate; basal part hardly bent towards the ventral side, fairly elongate, and with relatively small basal orifice, the lateral sides of which are moderately emarginate; sagittal aileron large though very thin and hyaline; viewed laterally, apical lobe long, very narrow, and curved ventrad, ending in a blunt extremity; viewed dorsally, apical lobe elongate, gradually tapering towards apex, which is narrowly rounded; ventral side nearly straight at middle in profile. Copulatory piece very large, about a half as long as aedeagus, narrowly spatulate, and with an elongate apical lamella, which is narrowly rounded at the apex; dorsal side of the piece expanding to the left, forming a wide lamella concave on the dorsal side. Styles long and slender, left style obviously longer than the right, each normally provided with two apical setae, though sometimes bearing three setae instead of two.

Type-series. Holotype: ♂, Shikanosawa, 1,530 m alt., 29–VII–1974, S. UENO leg. (NSMT). Allotype: ♀, Shikanosawa, 1,530 m alt., 30–VII–1974, S. UENO leg. (NSMT). Paratypes: 8♂♂, 6♀♀, Shikanosawa, 1,530 m alt., 29–30–VII–1974, S. UENO leg. (NSMT); 1♂, Shikanosawa, 1,550 m alt., 29–VII–1974, S. UENO leg. (NSMT); 1♂, Kuromi-daké, 1,680 m alt., 27–VII–1974, S. SHINONAGA leg. (NSMT); 1♂, 1♀, Hananoégô, 14–VIII–1965, N. KONISHI leg. (NSMT & TS).

Localities. Shikanosawa (type-locality!), Kuromi-daké and Hananoégô, all in the Yaé-daké Mountains of the Island of Yaku-shima, off southern Kyushu, Southwest Japan.

Notes. This interesting new species is primarily saprophilous, being found only in the subalpine forests on the Yaé-daké Mountains of the Island of Yaku-shima. The type-locality, Shikanosawa, is situated at the western side of the main peaks, while the other two localities lie at the southern part of them. The distance between Shikanosawa and Kuromi-daké is about 5 km when measured along the watershed ridge.

Most specimens of the type-series were taken from beneath wet dead leaves accumulated in a small depression of a narrow shady path through a mixed temperate forest. I also took some by sifting leaf mold in nearby places, but the trechine seemed to prefer the wet depression to the usual forest floor. Though this species was always found in coexistence with *Epaphiopsis watanabeorum*, it could be discriminated at a glance from the latter because of the unusually polished body surface. One of its paratypes was turned up from beneath a moss-covered stone near the water edge of the Shikanosawa Valley, and another paratype, from Kuromi-daké, was found under a flat stone at the side of a seepage. Nothing is known about the habitat of the Hananoégô specimens, but as the locality is very near to Kuromi-daké, they appear to have been met with in a similar environment. Anyway, all these collecting data show that the beetle is highly hygrophilous, probably more so than any of the other humicolous trechines known from the Japanese Islands.

Discussion

Of the four trechid beetles hitherto known from Yaku-shima, *Perileptus japonicus* is

the only species that is winged and not confined in the island. I have already made a brief discussion on the range of distribution and the mode of dispersal of this widespread perileptine (cf. UÉNO, 1974, pp. 158, 164–166), and have no intention to repeat it here. The remaining three species, all belonging to the tribe Trechini, are flightless and endemic to the island. They are discriminated into two groups of different phylogenetic origin, so that their derivation will be discussed separately.

First comes under consideration the very peculiar species, *Lamprotrechus convexiusculus*. Though much isolated, this new trechine seems to have a remote relationship with *Iga* of the high mountains of Shikoku, and may have been derived from an *Agonotrechus*-like ancestral stock. Existing species of *Agonotrechus* are either fully winged or brachypterous, having been known from the Himalayas, northern Burma (BATES, 1892, pp. 297–298; JEANNEL, 1923, pp. 428–431, 1928, pp. 85–90; ANDREWES, 1935, pp. 74–78), northern Viet-Nam (JEDLIČKA, 1939, p. 1) and Taiwan (JEDLIČKA, 1932, p. 82). The Taiwanese species (*A. horni* JEDLIČKA) is to a certain extent different from the others, but still belongs to the same group in a broad sense. No representatives of the genus or its very close relatives occur in the Japanese Islands at the present time. However, it is not difficult to surmise from the existing pattern of distribution that certain ancestral forms of this group may have extended their distribution to Southwest Japan in the past, perhaps in the Tertiary. As in the case of the existing species, those ancestral trechines may have been inhabitants of temperate forests at relatively low altitudes, and may have given rise to more specialized forms in high mountains at peripheral parts of their distribution.

Probable derivatives of the *Agonotrechus* stock are known in the eastern Himalayas (*Stevensius*—JEANNEL, 1923, pp. 432–435, 1928, pp. 90–93; ANDREWES, 1935, pp. 78–80; UÉNO, 1973, pp. 61–64), Tibet (*Kozlovites*—JEANNEL, 1935, pp. 279–281), Yunnan (*Stevensius* *gregoryi*—JEANNEL, 1937, pp. 87–88), Taiwan (UÉNO, unpublished), the Island of Yaku-shima (*Lamprotrechus*), and Shikoku (*Iga*—UÉNO, 1953a, pp. 30–32). They are not closely related to one another, and the true affinity of *Kozlovites caviceps* and *Stevensius* *gregoryi* remains uncertain as each of these species is known only on a single female specimen. Even the two Japanese representatives, *Lamprotrechus* and *Iga*, are considerably different from each other, as was already explained. However, each one of these genera seems to have a closer affinity to *Agonotrechus* than to any other described genus. This seems to suggest that they have become independently differentiated from the mother stock.

Unfortunately, neither *Lamprotrechus* nor *Iga* has been known from the Island of Kyushu that lies between Yaku-shima and Shikoku. This is in part due to the insufficiency of collectings, but it should also be taken into account that many of the high mountains in Kyushu are active volcanoes, which are much more recent than those of the other two islands. One of the two genera or their close relative may have occurred in Kyushu sometime in the past, but have become extinct at least in the large part of the island. In any case, the ancestor of *Lamprotrechus convexiusculus* must have arisen in the mainland of Kyushu, from where it invaded into Yaku-shima and became established there. Although Yaku-shima is not a very recent island, the uprise of the Yaé-daké Mountains is said to

have commenced in the late Tertiary. Therefore, it seems reasonable to surmise that the immigration took place in the latest Pliocene or the early Pleistocene, when the climate became cooler than before, and that the trechine has survived since then being protected by the stable, cool, wet climate of the Yaé-daké Mountains.

As compared with the case of *Lamprotrechus*, the derivation of the two *Epaphiopsis* species is much more apparent. They belong to the subgenus *Pseudepaphius*, whose members are widely distributed in Southwest Japan but nowhere else. Besides *E. janoi* of the Island of Yaku-shima, only three species of the subgenus have hitherto been described: *E. unzenensis* from Kyushu (JEANNEL, 1930, pp. 82–83), *E. ishizuchiensis* from Shikoku (UÉNO, 1962, pp. 71–73), and *E. punctatostriata* from the Chûgoku District (PUTZEYS, 1877, pp. 85–86). However, more than half a dozen species are now known in Kyushu, another half dozen in Shikoku, and a few others in the areas at the northern side of West Japan east to the Noto Peninsula (UÉNO, unpublished). No representatives of the subgenus occur in the Kii Peninsula or in the central part of the Kinki District. These figures clearly show that the subgenus became differentiated mainly at the western part of the ancient Kuma-Kii Mountains (nearly equivalent to southern Kyushu and Shikoku at the present time) and later dispersed from northern Kyushu through the Chûgoku District northeastwards to the Noto Peninsula. All these mainland species are relatively uniform in morphological features and dwell in temperate forests, usually at moderate altitude but sometimes near the sea-level. Therefore, they appear to have had a better chance to cross small barriers.

The two Yaku-shima species are the indubitable members of *Pseudepaphius*, so that their ancestors must have come from southern Kyushu, most probably on land during the Pleistocene. However, they are clearly different from mainland forms in elytral chaetotaxy and can be distinguished from the latter as an isolated species-group. This implies either that they have been isolated in the island long enough to develop such a peculiarity or that their ancestors happened to be chaetotaxially aberrant. It is not plausible that two ancestral forms bearing the same aberrancy independently reached Yaku-shima from the mainland, whereas there is no reason to regard their similarity as a result of convergence. Therefore, the two species must have been derived from a single ancestral immigrant through sympatric speciation. Nothing of their morphological features suggests which species is more advanced, and two opposed explanations are possible for the process of their speciation: *E. janoi*, which is commoner and much more widespread of the two, is the direct descendant of the original immigrant and gave rise to *E. watanabeorum* in a small area at high altitude on the western side of the island; or contrariwise, *E. watanabeorum* is the direct descendant and has retreated to the present habitat having been driven by the newly differentiated competitor, *E. janoi*. My impression is that the latter is more likely, as *E. janoi* is predominant in every respect.

To summarize, the trechid fauna of the Island of Yaku-shima bears a close relationship with those of southern Kyushu and Shikoku, and is considered to have been derived from the mother stock that had existed in the ancient Kuma-Kii Mountains. However, there is a certain difference in faunal details between Yaku-shima and southern Kyushu,

and the difference seems larger than that between Kyushu and Shikoku. Perhaps, the isolation of Yaku-shima may have been more complete and more long-standing than that of Shikoku from Kyushu, at least for such mountain-living flightless insects as humicolous trechine beetles.

要 約

屋久島からは、これまでにチビゴミムシ類が3種知られ、そのうちのひとつは固有種、他のひとつは固有の新属新種であることがわかっていた。1974年の夏に行なった現地調査で、従来調べられていなかった地域からさらに1新種が発見されたので、屋久島産のチビゴミムシ類は全部で4種になった。これらは次ぎのとおりで、あとのふたつが新種および新属新種である。

- 1) ホソチビゴミムシ *Perileptus japonicus* H. W. BATES
- 2) ヤクシマチビゴミムシ *Epaphiopsis (Pseudepaphius) janoi* (JEANNEL)
- 3) ワタナベチビゴミムシ *E. (P.) watanabeorum* S. UENO
- 4) ツヤチビゴミムシ *Lamprotrechus convexiusculus* S. UENO

以上の4種のうち、ホソチビゴミムシだけはよく発達した後翅をもち、アジア東部に広く分布しているが、他の3種は後翅の退化した飛べない虫で、屋久島以外の地域から発見される可能性がない。

ヤクシマチビゴミムシとワタナベチビゴミムシは、ともにケムネチビゴミムシ属 *Epaphiopsis* のサイカイチビゴミムシ亜属 *Pseudepaphius* に含まれる。この亜属の種類は日本の南西部に広く分布するが、とくに四国と九州とでいちじるしい種分化を遂げ、亜属の起源がこのあたりにあったことを示唆している。屋久島産の2種も、もともとは南九州から移住したものに違いないが、本土の種類とは上翅の剛毛式が明らかに異なるので、特別の種群として区別できる。したがって、これらの種の共通の祖先は、かなり早い時期に南九州の母体から隔離され、その後さらに同所的な種分化を起こして今日にいたった、とみてよからう。両種はたがいによく似ているが、ワタナベチビゴミムシのほうが小型で扁平、体色が暗く、前胸背板の後角がひじょうに鈍くて小歯状にならず、上翅の条線は浅くて点刻がきわめて弱い。また、雄交尾器の形態にも顕著な相違が見られる(図2~5参照)。

最後のツヤチビゴミムシは、四国の高山に生息するヒサゴチビゴミムシ属 *Iga* のものにかかなりよく似ているが、上唇の前縁が深く切れこんで二片状になっていること、前胸背板の側縁が完全であること、上翅の剛毛式がいちじるしく異なること、前脛節の外縁に縦溝がないことなどの点で明らかに異なり、後者との関係も直接的なものではないらしい。しかし、どちらの属も、かつてヒマラヤから東アジアにかけて広く分布していた有翅の祖先型から分化し、高山の特殊な環境だけに生き残ってきた遺存群であろうと考えられる。この原型に近いと思われる形態を現在までとどめているのは、台湾、北ベトナム、北ビルマおよびヒマラヤに分布するハバヒロチビゴミムシ属 *Agonotrechus* である。いっぽう、特殊化した型のほうは、四国、屋久島、台湾、雲南、チベットおよびヒマラヤ東部のいずれも高山のみに生息していて、それぞれ孤立した特徴をもち、相互の関係がかならずしも近くはない。この群のチビゴミムシ類は九州からまったく見つかっていないが、ツヤチビゴミムシの起源が九州のどこかにあったことはまず間違いなからう。おそらく更新世の初期に九州から屋久島へ侵入したものが、島が分離されるとともに八重岳の高所へ定着して現在まで生き残ってきたのであろう。

要するに、チビゴミムシ相から見た屋久島は、大きくとれば九州や四国と同じ生物地理学上の地域に含まれるけれども、これらとのあいだにかなり顕著な断絶が認められる。隔離された島としての歴史がそれほど古くないにもかかわらず、このように特殊性が大きいのは注目すべき事実で、おそらく八重岳が孤立した高山として離島の役割を果たし、しかも降水量が多くて良好な生活環境が保たれてきたことに起因するのであろう。

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